Materials Tip

Materials Engineering Branch

Locking of Fasteners			
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It is imperative that fasteners not only be tightened to the proper axial preload but that the preload also be maintained throughout the operating life of the structure. Numerous methods are available to the spacecraft designer for ensuring that fasteners do not loosen and fail.

POSITIVE LOCKING DEVICES--Cotter pins, lockwire--Offer positive locking of fasteners but require specialized fastener features that may entail longer procurement lead times. Other disadvantages include somewhat greater weight and increased assembly and disassembly time.

LOCKING POLYMERS--Uralane 5753LV A/B or Solithane 113/300 can be applied to lock threads and also allow for future disassembly. Disadvantages: Messy and time-consuming to apply during assembly. Difficult to clean on disassembly and can generate particulates. Epon 828/Versamid 140 effectively locks but precludes disassembly.

PREVAILING TORQUE LOCKNUTS--SOFT INSERT--Kel-F or Vespel are the preferred insert materials are pressed into slots (bolts) or into collars or drilled holes (nuts) to provide an interface fit between mating elements. Advantages: convenient, good retaining torque, and high reusability for Kel-F. Disadvantages: galling has resulted from flash associated with machining the slot and hole recesses, the leading edge of helical thread inserts cuts the soft polymer in the bolts and destroys the locking effectiveness and reusability of Vespel.

PREVAILING TORQUE LOCKNUTS--ALL METAL--out-of-round collar and deflected beam types are preferred to a deflected thread design. Advantages: good locking torque, high galling resistance, and high reusability. The chief disadvantage is that numerous disassembly/reassembly cycles scar bolt threads and may generate particulates.

LOCKING HELICAL INSERTS--helical inserts lock by means of one crimped wire turn. Advantages: convenient, good locking torque on initial installations. Disadvantages: limited reusability, and wire-type slivers result during repeated assembly/disassembly cycles.